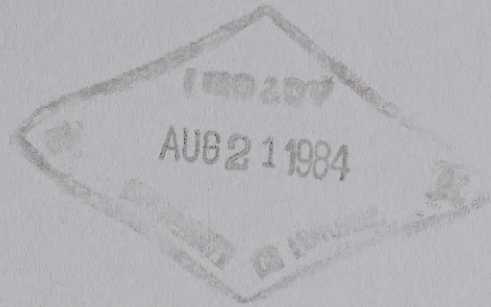
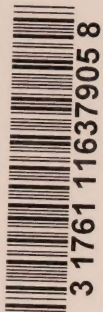


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## NATIONAL ENERGY BOARD REASONS FOR DECISIONS

In the Matter of the Application Under  
the National Energy Board Act

of

British Columbia Hydro and Power Authority

July 1984





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REASONS FOR DECISIONS

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(i)

## **NATIONAL ENERGY BOARD**

In the matter of the National Energy Board Act and the Regulations made thereunder, and

In the matter of an application by British Columbia Hydro and Power Authority (hereinafter called "the Applicant") for the renewal, with modifications, of its export Licences EL-128, EL-130, and EL-127, pursuant to Part VI of the National Energy Board Act, filed with the Board under file number 1923-4/B4-7.

HEARD in Vancouver:

26, 27, 28, 29 and 30 March 1984.

### **BEFORE:**

A.D. Hunt	Presiding Member
A.B. Gilmour	Member
W.G. Stewart	Member

### **APPEARANCES:**

D.C. Duff	B.C. Hydro and Power Authority
D.A. Austin	
A.S. Hollingworth	Alberta Petroleum Marketing
J. McNamara	Commission
J. Strekaf	Alberta Power Limited
P. Feldberg	Aluminum Company of Canada
C.W. Sanderson	
T.D. Tutti	Cominco Limited
L. Malkin	Fording Coal Limited
H.D. Williamson	TransAlta Utilities Corporation
J.W.M. Wilson	West Kootenay Power and Light Company Limited
P.G. Griffin	Westcoast Transmission Company Limited
D. McCaughey	B.C. Wildlife Federation
G. Kenyon	
B. Wallace	British Columbia NDP Legislative Caucus
A.L. McLarty	Canadian Petroleum Association
R. Salter	Carrier Sekani Tribal Council
A. Hulbert	City of Port Moody
M. Rush	Communist Party of Canada
R. Gathercole	Consumers Association of Canada (B.C. Branch), et al
S. Rush	Gitksan-Wet'su'weten Tribal Council
N. Sterritt	
R. Overstall	

(ii)

P. George	Green Party of British Columbia
D. Rosenbloom	Kaska Dena Tribal Council
P. Stone	
J. Woodward	McLeod Lake Indian Band
G. Edwards	Peace Valley Environment Association
C. Evans	Regional District of Central Kootenay
M. Doherty	Sierra Club of Western Canada
P. Martin	
C. Stainsby	Society Promoting Environmental Conservation
J.M. Black	Himself
K. McAllister	Himself and Judicial Action
S. Parker	M.P. for Kootenay, East-Revelstoke
S.K. Fraser	Board Counsel



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## ABBREVIATIONS USED IN THE REPORT

### For Units of Measurement

<b>GW.h</b>	gigawatt hour (1 million kW.h)
<b>km</b>	kilometre
<b>kV</b>	kilovolt
<b>kW.h</b>	kilowatt hour
<b>MW</b>	megawatt
<b>mill</b>	one tenth of a cent (expressed in Canadian funds unless otherwise stated)
<b>MW.h</b>	megawatt hour
<b>\$</b>	dollars (expressed in Canadian funds unless otherwise stated)

### For Names

<b>"Alberta Power"</b>	Alberta Power Limited
<b>"Alcan"</b>	Aluminum Company of Canada Limited
<b>"the Applicant" or "B.C. Hydro"</b>	British Columbia Hydro and Power Authority
<b>"the Board" or "NEB"</b>	National Energy Board
<b>"Bonneville" or "BPA"</b>	Bonneville Power Administration
<b>"Burrard"</b>	Burrard Generating Station
<b>"the CAC et al"</b>	The Consumers' Association of Canada (B.C. Branch), The British Columbia Old Age Pensioners' Organization, The Federated Anti-Poverty Groups of British Columbia
<b>"Cominco"</b>	Cominco Limited
<b>"NEB Act" or "the Act"</b>	National Energy Board Act
<b>"TransAlta"</b>	TransAlta Utilities Corporation
<b>"Westcoast"</b>	Westcoast Transmission Company Limited
<b>"West Kootenay"</b>	West Kootenay Power and Light Company Limited



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# Chapter 1

## Executive Summary

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### THE APPLICATION

In March 1984, the Board held a public hearing in Vancouver on two applications by B.C. Hydro.

The first application was for the renewal, with modifications, of three of B.C. Hydro's existing electricity export licences, which are due to expire on 30 September 1984. Of the three, two were at issue during the hearing: the licence for exports of firm power and the licence for the export of interruptible energy. The third licence involves inter-utility accommodations. For all three licences B.C. Hydro applied for terms of six years commencing 1 October 1984.

The second application was for approval of the so-called "Los Angeles Agreement", which provides for firm energy exports to Los Angeles, California.

### THE DECISION

The main features of the Board's decision follow:

- The Board is satisfied that B.C. Hydro will have firm power and energy surplus to reasonably foreseeable Canadian requirements in the four-year period up to 1988, but not in the last two years of the licence period applied for.
- The Board is satisfied that a quantity of up to 15 000 GW.h per year could be surplus to Canadian requirements and available for export under an interruptible licence.
- The Board is not prepared to give any credit at this time for supply, reserve, or surplus of capacity or energy that might be generated at the Burrard generating station during normal operations.

- For interruptible and firm exports the Board will set a floor price for power and energy of 11 mills/kW.h at the international border. The Board expects that most of the time the actual prices will be well above this floor price.
- For firm exports, the Board is satisfied that in the present circumstances it would be beneficial to Canada to allow B.C. Hydro to enter into contracts for firm power exports at a price lower than that for interruptible energy, as long as the price is above the floor price of 11 mills/kW.h.
- The Board will require that interruptible energy be open to interception by, and that exports of firm power and energy be first offered to, all interconnected electric utilities in British Columbia and Alberta on terms, including price, not less favourable than those negotiated with the foreign purchaser
- Since the Board deems as exports any energy produced by Burrard while exports are being made, the Board is not at this time prepared to issue a licence permitting the export of power from Burrard except under emergency conditions or where Burrard is placed in service for operational purposes, including testing.

### ISSUE OF LICENCES

The Board is recommending that the Governor in Council approve the following three new licences:

- (a) a new licence for exports of firm power and energy in amounts of up to 2 000 MW and 6 000 GW.h per year for approximately four years ending 30 September 1988.
- (b) a new six-year licence from 1 October 1984 to 30 September 1990, for exports of interruptible energy with a maximum quantity of 15 000 GW.h per year less the amount exported under the firm power licence

---

Note: This summary is provided solely for the convenience of the reader and does not constitute part of this decision or the reasons for it.



- (c) a new six-year licence from 1 October 1984 to 30 September 1990, permitting the export of up to 3 000 GW.h per year as inter-utility carrier transfers of unscheduled circulating equichange of inadvertent power and energy for simultaneous return to Canada

#### **LOS ANGELES AGREEMENT**

The Board is prepared to approve the Los Angeles Agreement under the firm power licence subject to the approval of that licence by the Governor in Council.

# Chapter 2

## The Application

### 2.1 Background

British Columbia Hydro and Power Authority ("B.C. Hydro") is a crown corporation operating in British Columbia. The Company provides electrical service to most of British Columbia, the main exception being the area served by Cominco Limited ("Cominco") and its subsidiary, West Kootenay Power and Light Company Limited ("West Kootenay"). The map included as Appendix 1 shows the main generation and transmission facilities of B.C. Hydro.

B.C. Hydro's system is interconnected in the north with the system of the Aluminum Company of Canada Limited ("Alcan") at Kitimat, in the east with the system of TransAlta Utilities Corporation ("TransAlta"), in the southeast with the systems of Cominco and West Kootenay, and in the south with the system of the Bonneville Power Administration ("Bonneville"). Bonneville is an agency of the United States Government, with extensive generation and transmission facilities in the Pacific Northwest area of the United States.

There are four international power lines connecting the B.C. Hydro and Cominco systems to the Bonneville system, as shown by the maps in Appendix 2. Two 500-kV lines cross the international boundary at Douglas, British Columbia, near Vancouver, and two 230-kV lines cross the border at Nelway, British Columbia. In addition, B.C. Hydro owns an international power line that supplies the isolated distribution system of Puget Sound Power and Light Company ("Puget") in the Point Roberts area of the State of Washington. This line appears on the upper map of Appendix 2.

To authorize the export of power over these various international power lines, the Applicant holds Licences EL-126, EL-127, EL-128, EL-129, and EL-130. The licences were issued by the Board in March 1980<sup>1</sup>, and expire on 30 September 1984.

B.C. Hydro is a member of the Northwest Power Pool, which includes Cominco and TransAlta as well as utilities in Washington and Oregon. B.C. Hydro is also a member of the Western Systems Coordinating Council, a voluntary organization that promotes adequacy and reliability of bulk power supply.

### 2.2 Application for Renewal of Licences

In an application dated 23 December 1983, B.C. Hydro applied to the Board for renewal, with modifications, of Licences EL-128, EL-130 and EL-127. Modifications included the increase in the term of the licences to 6 years, increases in quantities and modifications to conditions of two of the licences.

The application was for the authorization of exports for the period from 1 October 1984 to 30 September 1990 and was as follows:

(a) *Short-term Firm Power and Energy - (Replacement for EL-128)*

Firm power and energy as sale and exchange transfers at Douglas and Nelway of up to 2 000 MW and 6 000 GW.h per year.

EL-128 authorizes exports of up to 2 000 MW and 3 000 GW.h per year. Condition 10(a) of EL-128 requires that the price for firm power and energy shall be greater than the expected price for interruptible energy. B.C. Hydro requested the deletion of this condition. Condition 11 of EL-128 allows for the commitment of blocks of firm power or energy for periods of up to one year. B.C. Hydro requested approval to make commitments for periods of up to six years.

b) *Interruptible Energy - (Replacement for EL-130)*

Interruptible energy as sale, exchange, storage adjustment, and carrier transfers at Douglas and Nelway, of a quantity not to exceed 15 000 GW.h per year, less exports under the firm licence.

<sup>1</sup> Reference: NEB Reports to Governor in Council on the application of B.C. Hydro, Part A, Licences, March 1980 and Part B, Certificate, January 1980

EL-130 authorizes interruptible exports up to 10 000 GW.h per year, less exports of firm power and energy. Condition 8(b) of EL-130 requires the Licensee to sell energy to Canadian utilities willing to buy "at the same price" as the export sale. B.C. Hydro requested that the condition be changed to read "under the same terms and conditions, including price". B.C. Hydro also requested the deletion of Conditions 9(b) and 12 which were no longer applicable.

(c) *Carrier Transfer Circulating Loop Power Flow Licence*

Power exported as a carrier transfer at Douglas, B.C. and Nelway, B.C. for simultaneous return to Canada ("loop power flow") up to 3 000 GW.h per year. (This licence would replace Licence EL-127, which authorizes exports of power as a carrier transfer of up to 2 000 GW.h per year.)

The maximum total export applied for, excluding carrier transfers for return to Canada, was 15 000 GW.h per year.

With letters dated 9, 17, and 24 February 1984, B.C. Hydro supplied revised and additional information relating to this application. The application was set down for public hearing and commenced in Vancouver on 26 March 1984.

### **2.3 Application for Approval of Export Sales Agreement**

Also considered at the public hearing was a separate application filed by B.C. Hydro in February 1984 for approval of an energy sales agreement, dated 26 January 1984, with the Department of Water and Power of the City of Los Angeles, for export sales of firm energy under Licence EL-128.

During the public hearing, B.C. Hydro stated that it was also seeking approval of the Los Angeles Agreement for export of firm energy under the new firm power and energy licence for which it had applied to replace EL-128.



## Chapter 3

### The Evidence

The evidence presented by B.C. Hydro in support of its application is summarized below, as are views of intervenors.

#### 3.1 Load Forecasts

B.C. Hydro stated that each year it prepares new eleven and twenty-one year load forecasts<sup>1</sup>. The 1983-84 peak load was 6 010 MW, with an energy demand of 33 530 GW.h.

Evidence was given that the rate of growth of demand for power had been slower in the past five years than in the preceding decade and that the character of the load was changing. Over the period 1982/83 to 1993/94, B.C. Hydro forecast an annual average growth in demand of 3.9 percent. This forecast was based on the assumption of a population growth of 2 percent per year over the next 11 years; a growth in Gross Domestic Product averaging 4 percent per year from 1982 to 1993; electricity and gas prices increasing in real terms by 12 percent by 1988 and remaining constant thereafter; and oil prices decreasing slightly in real terms from 1983 to 1990 and increasing slightly thereafter.

Approximately 6 000 GW.h of the projected increase of some 14 500 GW.h in sales over the forecast period were in the Transmission Rate Category<sup>2</sup>, with additional requirements of pulp and paper and wood manufacturing accounting for over 50 percent of this increase. Projected industrial requirements made no allowance for a possible LNG (liquefied natural gas) plant or for a possible new Alcan smelter.

Sales to the residential and general sectors were projected to grow at about 2.5 percent and 2.8 percent per annum respectively.

In response to cross-examination, B.C. Hydro indicated that its forecast did not allow for a continuation of the current incentive-pricing tariff for certain large industrial customers. However, it did indicate that a continuation of this scheme would not have much impact on its load forecast. Similarly, B.C. Hydro indicated that the forecast would not be significantly affected if the proposed gas pipeline to Vancouver Island were not constructed during the forecast period or if natural gas prices were somewhat higher than forecast.

B.C. Hydro stated that forecasts of demand to 1990 make no provision for firm supply to Alcan since Alcan had not indicated any projected needs for power and energy. However, Alcan plans to construct additional aluminum smelters and power generation facilities at Kitimat, and has filed applications for the necessary approvals and permits with British Columbia provincial authorities. Several intervenors took the position that the surplus power and energy that B.C. Hydro proposes to export should be supplied to Alcan, thus reducing or deferring the need for Alcan to construct new facilities. Counsel for Alcan stated that the Company had applied to construct its smelters and power development as an integrated project and had no plans to seek firm power from B.C. Hydro. The evidence shows that it would be necessary to start construction of the power development two years earlier than for the smelters if both were to be placed in service at the same time. If a different schedule were adopted for any reason, Alcan could require some firm power in the late 1980's. The Energy Removal Certificate recently issued to B.C. Hydro by the B.C. Minister of Energy requires B.C. Hydro to reserve 1 000 GW.h of energy for Alcan in the water year 1989-90.

B.C. Hydro's load forecasts included the projected requirements of West Kootenay as well as the future loads of Point Roberts in the United States, as is consistent with past practice. In addition, B.C. Hydro has included as part of its firm demand its future obligations to Seattle City Light under the Skagit River Treaty.

1 The Applicant filed forecasts for a range of economic conditions indicating "probable", "probable high", "probable low", "high" and "low" load scenarios. The predicted loads under the "probable" scenarios are shown in Appendices 4, 5 and 6.

2 This category includes power supplied in bulk to large industrial customers at transmission line voltage who then distribute the power in their plants at lower voltages.

### 3.2 Generating Capacity and Additions

B.C. Hydro stated that the present peak generating capacity of its system is approximately 9 769 MW, of which 9 437 MW is hydroelectric generation; the balance consists of generation from a number of small gas turbine plants (see Appendix 4). In addition, the gas-fired Burrard generating station has a generating capacity of 900 MW.

The Burrard generating station located near Port Moody, just north of Vancouver, is owned and operated by B.C. Hydro. Originally a dual-fired plant (oil and natural gas), Burrard now operates solely on gas for environmental reasons. B.C. Hydro is in the process of applying for permits under the Provincial Waste Management Act to allow it to operate this plant on an on-going basis; currently, provincial authorities allow its operation only for emergencies or operational requirements.

In calculating its surplus of capacity available for export at the time of annual peak load, B.C. Hydro did not include the Burrard Plant, because of constraints on the gas supplies to the plant during the peak demand months of December, January, and February. Hence, the table of capacity, demand and surplus at the time of annual peak load on the export grid, shown in Appendix 4, does not include the capacity of Burrard. However, after considering the availability of natural gas at other times of the year, the Applicant included an energy credit of 3 430 GW.h per year for Burrard. This credit is shown in energy capability tables in Appendix 6 and 7, even though Burrard may not be used for normal generation until such time as permits under the B.C. Waste Management Act are obtained. A witness for B.C. Hydro stated that he expected the permit would be issued during 1984.

With the exception of Revelstoke, no major additional new generation or transmission facilities are scheduled to be placed into service during the requested licence period. A witness for the Applicant testified that the completion of the Revelstoke plant could not be delayed beyond 1984, even though the growth rate in demand for electricity had declined subsequent to the commencement of construction of the Plant. As a result, an amount of energy approximately equivalent to its output would not be required immediately upon completion of construction.

To provide a back-up in the event of equipment outages, B.C. Hydro maintains a reserve of capacity, as shown in Appendix 4. The reserve requirements of B.C. Hydro are calculated using probability techniques based on a loss of load expectation of one day in ten years. B.C. Hydro stated that its 500 kV interconnection with Alberta would reduce its required reserve, for the same level of reliability, by 400 MW. This reduced reserve requirement is shown as a reserve pooling credit in Appendix 4.

### 3.3 Power and Energy Surplus

The Applicant's estimates of generating capacity, demand, reserve, and surplus at the time of the annual peak load are summarized in Appendix 4 for each water year (1 October - 30 September). The minimum surplus to its loads occurs during December, the month of peak demand.

The minimum surplus of capacity under dependable flow conditions, after allowing for reserves and the "probable" load growth scenario, was estimated by B.C. Hydro to be as follows:

**Minimum Surplus under Dependable Flow**

Water-Year	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
Megawatts	2 539	2 159	1 974	1 874	1 584	1 384

As B.C. Hydro has considerable water storage, mainly in the Williston Lake and Mica reservoirs, it uses a five-year low flow period rather than a single year in estimating dependable energy production. During the 40-year period from 1940 to 1979 used for streamflow estimates, the five-year critical period of minimum, or dependable, flows occurred between October 1942 and September 1948. The flows of these critical years have been used for the calculation of dependable energy capability during the requested licence period.

The Applicant's estimates of annual energy capability, loads, and surplus on its system under probable load growth assumptions are summarized in Appendix 5 for dependable streamflow conditions and in Appendix 6 for average streamflow conditions. The surpluses are shown in the following table:

**Surpluses to B.C. Hydro's Market Area  
under Probable Load Growth  
(gigawatt hours per water year)**

	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
<b>HYDRAULIC SURPLUS</b>						
Dependable flows	5 100	4 800	2 100	1 830	0	2 174
Average flows:	10 012	8 781	7 080	6 488	4 509	3 848
<b>THERMAL SURPLUS</b>	3 430	3 430	3 430	3 430	3 430	3 430

The surpluses to the requirements of B.C. Hydro's system that result under the highest streamflow conditions on record for various load growth scenarios are illustrated in Appendix 7.

The evidence showed that the planning of hydroelectric generating plants to meet domestic demand under dependable flows results in the utility having power and energy surplus to its loads at times of average water flows. In recent years water flows have been above dependable flows and forecast demands have not materialized, resulting in additional surpluses to B.C. Hydro's loads.



Witnesses for B.C. Hydro stated that the strategy of the utility is to market the power and energy surplus to its own requirements to the best of its ability to yield increased revenue to the utility with a resulting reduction in the rates for Canadian customers of B.C. Hydro.

### **3.4 Canadian Markets for B.C. Hydro's Surplus Power and Energy**

In regard to selling excess energy within British Columbia, B.C. Hydro explained that it has examined various options. For example, it has offered incentives in the form of lower rates to some industrial customers. Surplus firm power and energy that is available for export is first offered for sale to inter-connected Canadian utilities on terms no less favourable than those to a purchaser in the export market.

B.C. Hydro noted that a 500-kV interconnection between B.C. Hydro and TransAlta is expected to enter service in 1985. Under an exchange agreement made with Kanelk Transmission Company Limited (the owner and operator of the line), the two utilities will be able to provide extensive mutual support and will have the opportunity to sell or exchange large quantities of power and energy.

Alberta Power requested that it be given access to the energy proposed to be exported from B.C. Hydro although it is not directly interconnected with B.C. Hydro.

### **3.5 Export Markets for Surplus Power and Energy**

A witness for the Applicant stated that the principal export market for surplus energy from B.C. Hydro is now in California where it can displace thermal generation. In addition, a significant market may develop in the Pacific Northwest owing to changing patterns of power supply, demand and surplus in that region of the United States. At present, that market is principally for short- and medium-term supplies. B.C. Hydro expects that by 1990 there may begin to be opportunities for long-term contract sales of 10 or 15 years in duration, or more, in the region. Further, the utility has recently begun studies regarding the possibility of building additional hydro facilities in advance of domestic need to take advantage of these perceived export market opportunities.

The Applicant also stated that significant increases in tie-line capabilities between the Pacific Northwest and Southwestern regions of the U.S. are committed or under construction to be placed into service in the period 1985 to 1990.

B.C. Hydro stated that streamflow conditions do not always coincide in domestic and export markets. Thus, under conditions of high streamflows in British

Columbia and low stream flows in the Pacific Northwest, B.C. Hydro has a good opportunity to make profitable exports. If high streamflow conditions are experienced in the United States at the same time as in British Columbia, resulting in surpluses on the systems of both B.C. Hydro and Bonneville, B.C. Hydro may be prevented from exporting energy on an interruptible basis to the United States market because of United States transmission limitations.

### **3.6 B.C. Hydro Costs, Export Prices and Terms of Sales**

B.C. Hydro estimated that its cost of hydro energy was 5 mills/kW.h. This figure was composed of an estimate of the incremental cost of production of hydro energy of 1 mill/kW.h, plus water rental charges of 4 mills/kW.h. Thus, export sales at prices above 5 mills/kW.h would be profitable. For exports of gas-fired energy, the price would be calculated as 1.05 times the cost of natural gas 3 mills/kW.h. The cost of gas would be equivalent to gas export prices except in emergencies when B.C. Hydro's cost of gas would apply.

The rates charged by Bonneville on an interim basis to wheel the energy from the international border to the market areas depend on the transmission lines involved. The rates are as follows:

Northern Intertie	1.45 mills/kW.h
Energy Transmission	1.86 mills/kW.h plus 2.5% losses
Southern Intertie	1.35 mills /kW.h plus 3.0% losses

A witness for B.C. Hydro stated that the California utilities have been seeking to establish a steady price for interruptible energy for a number of years. The witness stated that, as the recent market price for interruptible energy at the international border had been ranging from 10 to 29 mills (U.S.) per kW.h, with an average rate of 26 mills (Canadian) per kW.h in 1983, B.C. Hydro was unwilling to enter into long-term price commitments for interruptible energy. The Applicant had, however, found it beneficial to enter into contracts with the California utilities to make block sales of energy at a fixed price with a duration of about two weeks.

Condition 8(b) of Licence EL-130 requires B.C. Hydro to sell to Canadian electrical utilities "at the same price" as an export sale all or part of the energy which it is exporting. B.C. Hydro argued that timing and scheduling of deliveries are just as important as price to be paid and should be the same for all purchasers in order to provide the maximum benefit to customers in the Applicant's service area. In its application for renewal of the interruptible energy licence, B.C. Hydro requested that the condition applicable to the purchase of the energy by any Canadian electric utility willing to buy all or part of it



be changed to read "under the same terms and conditions, including price", as the export sale.

A witness for B.C. Hydro stated that it is customary to make sales of blocks of interruptible energy for periods of about fourteen days and that sales of this type could be for periods of up to one month. These sales are made, typically, under agreements which specify the terms and conditions of sale. B.C. Hydro was willing to accept that a Canadian utility could interrupt the sale of an export of energy at any time before or after the transmission of the block had commenced. Other terms and conditions applicable to the block sale would apply to the part of the block taken by the Canadian utility.

West Kootenay opposed the Applicant's request to modify Condition 8(b) of Licence EL-130 on the grounds that it would be unfair for B.C. Hydro to arrange terms and conditions to suit its customers in the United States and then offer the power and energy proposed for export to Canadian utilities only if they would purchase the power under the same terms and conditions.

The CAC *et al* opposed B.C. Hydro's proposed modification on the grounds that West Kootenay might not have the same requirements as United States utilities purchasing energy from B.C. Hydro and, therefore, might not be able to purchase energy under the same terms and conditions, especially with respect to timing and scheduling.

In its application for renewal of the firm energy licence, B.C. Hydro stated that the price of energy in the export market area varies widely depending on the availability of water and transmission. B.C. Hydro sought deletion of the existing requirement that the export price of firm energy must be higher than that of interruptible energy. In support of this request B.C. Hydro argued that it required this freedom to negotiate the best possible terms in a highly competitive market. A witness for the Applicant stated that higher revenues were likely to be achieved from longer-term sales even if the rate were lower than that which could be realized from less frequent short-term sales. West Kootenay contended that acceding to this request would result in a loss of incentive to B.C. Hydro to make exports on an interruptible basis and that the resulting firm export sales would mean that this firm power would no longer be available to meet any Canadian requirements which might occur and which might reasonably be served.

Testimony was given by B.C. Hydro that it sought a firm power licence to be able to meet the market opportunities that might arise in the rapidly changing United States market. Opportunities might arise to sell capacity only, energy only, or both together. No definite estimate could be made of the likely duration of firm contracts that might be

negotiated, but the Applicant sought a duration of six years to provide for maximum flexibility in accommodating expected opportunities.

B.C. Hydro estimated the least cost alternative price of assured energy in one proposed market area to be in the range of 24 to 26 mills (U.S.) per kW.h at the Nevada and Oregon border for the period 1983-86.

### **3.7 System Performance**

The Applicant stated that the proposed exports would not hamper system performance. Load-flow diagrams and associated computer print-out sheets were provided as part of the application showing the results of load flow tests on the system under selected loading conditions in each year of the requested licence period. The Applicant had investigated the effect of exports on the level of generation shedding in the presence of other contingencies in the integrated system.

### **3.8 Loop Power Flows**

Evidence was given that because of the transmission links at Douglas-Blaine and Nelway-Boundary, loop flows in the American and British Columbia transmission system give rise to unscheduled power flows between Canada and the United States. In such cases the power and energy exported are imported back into Canada simultaneously and there is no net export except for minor transmission losses. Loop flows of energy during the period of the licences applied for were estimated to range up to 3 000 GW.h per year.

### **3.9 Environmental Conditions**

The Applicant stated that the proposed exports would cause no increase in the environmental effects already associated with its hydroelectric operations.

Several intervenors expressed concern that the construction of generating facilities causes damage to the environment, and they questioned the policies adopted by B.C. Hydro in planning to meet the domestic demand and in paying compensation to affected parties.

As for the Burrard Plant, a witness for B.C. Hydro stated that the utility is planning to submit applications for permits under the Waste Management Act and expects a decision on the applications during 1984. Meanwhile, the utility has made interim arrangements with the regulatory authorities which permit Burrard to be operated for operational reasons or to meet emergencies. Evidence was given that it is not good operating practice to fire up and shut down the Burrard station frequently and therefore, if a situation arose which required its use, it is likely to be kept in service for some days. Although the energy removal certificate issued by the Government

of British Columbia does not permit exports from Burrard, the Applicant asked that any export licence to be issued by the Board not contain such a restriction.

Several intervenors took the position that there should be no exports of thermally-generated power or that such exports should be limited to emergency situations. The City of Port Moody, and others, indicated to the Board their concerns regarding further deterioration of air quality in the areas surrounding the city because of the operation of the Burrard plant.

### 3.10 Derivation of Requested Licence Limits

The applicant stated that it is seeking licences having a term of six years (rather than the approximately four and a half year term of the current licences) in part to minimize the time, effort and cost involved in seeking new licences and in part because it would not be planning any new generating or associated transmission facilities to be placed in service before 1990. Thus the general operating parameters of the system will not vary significantly during the six-year period.

#### (a) *Short-Term Firm Power and Energy Licence*

B.C. Hydro indicated the requested 2 000 MW capacity limit is based on the present transmission capability to the United States. The requested energy limit of 6 000 GW.h is the maximum amount that the Applicant could produce by operating its large reservoirs for maximum production and by purchases in the first few years of the licence period. Evidence indicated that in the last two years or so, surplus production would be below 6 000 GW.h per year under certain conditions.

The CAC *et al* opposed the proposed firm licence for three main reasons. First, it was concerned about the possibility of domestic shortages which might occur if this licence were granted and future demand were greater or future supply were less than anticipated. Secondly, the CAC *et al* was concerned that the granting of a six-year firm export licence might encourage both B.C. Hydro and its United States customers to rely on the longer term availability of firm power exports from British Columbia. Thirdly, the CAC *et al* opposed a six-year firm licence because it did not believe B.C. Hydro had demonstrated a need for such a licence. The CAC *et al* and other intervenors maintained that B.C. Hydro had not provided any market evidence showing a requirement for a long-term firm licence and that B.C. Hydro had not demonstrated it had access to firm transmission capacity to the California market.

Other intervenors opposed the issuance to B.C. Hydro of a licence to export firm power on the grounds that such exports would lead to a commitment to continue supplying power beyond the contract periods specified in export agreements. Thus, power that might be required in Canada in future would not be available.

#### (b) *Interruptible Energy Licence*

The second licence requested was for the export of up to 15 000 GW.h per year of interruptible energy, less any energy exported under the firm power licence. The annual hydroelectric surplus was estimated to vary from zero in one year under dependable flows to 15 000 GW.h under lower-than-predicted load growths and higher-than-recorded flows. As future streamflows and thus the actual annual surplus cannot be predicted with any degree of reliability, the Applicant requested that the licence limit not be shaped to reflect a narrow forecast of surplus. B.C. Hydro asked that the entire requested quantity of 15 000 GW.h should be licensed, given that sufficient safeguards could be included in the licence conditions to ensure that Canadian priorities are protected.

#### (c) *Carrier Transfer Circulating Loop Power Flow Licence*

The third licence requested was for "loop power" flows. A witness for B.C. Hydro described the origins of this power and stated the estimated quantities of these flows had been calculated in considerable detail. Exported power and energy flow back to Canada simultaneously, so there is no net export except for losses. A maximum licence limit of 3 000 GW.h per year was requested.

### 3.11 The Los Angeles Agreement

B.C. Hydro filed copies of an agreement dated 26 January 1984 ("The Los Angeles Agreement") between it and The Department of Water and Power of the City of Los Angeles, for the sale of firm energy to Los Angeles and the cities of Burbank, Glendale, and Pasadena during the period 1 November 1983 to 31 October 1986. The agreement would become effective if approved by the Board.

B.C. Hydro stated that it is making exports to Los Angeles under its interruptible energy Licence EL-130 generally in accordance with the agreement but on an interruptible basis. The Board was asked to approve the agreement for sales under short-term firm energy Licence EL-128 until it expires on 30 September 1984 and thereafter under the newly sought licence for firm exports.

Under the Los Angeles Agreement, B.C. Hydro proposes to export at a target level of 3 000 GW.h in the year ending 31 October 1984 at a price of 20 mills (U.S.) per kW.h at the international border, 3 000 GW.h to 31 October 1985 at 21 mills (U.S.) and 3 500 GW.h to 31 October 1986 at 22 mills (U.S.). The agreement includes various clauses under which B.C. Hydro shall not be obligated to supply and Los Angeles shall not be obligated to take or pay for energy. The agreement is for the sale of surplus hydraulic energy and allows for the shaping of energy deliveries in the light load hours. Under the terms of the agreement, B.C. Hydro would return to Bonneville the energy obligation of Los Angeles under an exchange agreement between Los Angeles and Bonneville (LAMUN account). The agreement also provides for the direct sale of energy to Los Angeles.

In justifying the prices contained in the Los Angeles agreement, a witness for B.C. Hydro stated that the utility had made estimates of a reasonable least cost alternative price of energy in Los Angeles net of wheeling and losses. At the time the agreement was negotiated this amounted to approximately

24 mills per kW.h in United States funds. B.C. Hydro felt that it was necessary to set its price at about 85 percent of the least cost alternative price in order to secure this contract. This resulted in a final price of 20 mills (U.S.) at the international border in 1983/84. The utility estimated escalation to be about 5 percent per year, which resulted in prices of 21 and 22 mills (U.S.) in the second and third years, respectively, of the agreement.

It was the position of CAC *et al* that the Los Angeles Agreement should be approved, but under the existing interruptible energy licence. The CAC *et al* argued that the Los Angeles contract was essentially similar to an earlier one with Washington Water Power<sup>1</sup>, which the Board had deemed to be an interruptible contract. The CAC *et al* also stated that B.C. Hydro was currently selling electricity to the Los Angeles utilities on an interruptible basis and that no evidence had been presented to indicate that this was an unsatisfactory arrangement.

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1 NEB Reasons for Decision on the Application of B.C. Hydro, Part A, Licence, March 1980, Appendix 8-D



## Chapter 4

### Disposition

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In arriving at its disposition, the Board has relied upon the applications dated 23 December 1983 and 7 February 1984 and supplements and amendments, submissions from intervenors, and evidence adduced and argument presented at the public hearing.

#### **4.1 Power and Energy Surplus to the System of B.C. Hydro**

It is the view of the Board that B.C. Hydro has endeavoured to adjust its construction program so that the facilities coming into service match the actual loads placed upon the system.

It is noted that, with the exception of Revelstoke, no new major generating capacity will come into service before 1990 at the earliest. The Board accepts the contention of B.C. Hydro that the Revelstoke project was planned to serve anticipated Canadian loads, and that when these loads failed to materialize the completion date of Revelstoke could not reasonably be delayed beyond 1984.

The Board is satisfied that when there are periods of excess capacity it is symptomatic of an inherent characteristic of electric power systems: new generating plants can be added only in discrete increments, and actual loads may differ from those forecast some years earlier at the time of project approval. In addition, the Board is satisfied that a utility must plan to meet its probable load under dependable supply circumstances; this too may result in an excess of capacity or energy at times when these conditions do not prevail.

Several intervenors opposed the export of firm energy on the grounds that approval of such exports would be a signal to B.C. Hydro to plan and construct new hydro generating facilities dedicated to serving export markets. Such projects could have associated environmental and socio-economic impacts not acceptable to the intervenors. Although it would appear that B.C. Hydro is examining the possibility of expanding generating capacity to serve some potential export markets, the Board is not persuaded that B.C. Hydro has at this time adopted such a policy nor

that the approval of the export, on a firm basis, of its current surplus would have any significant bearing on such a decision.

The interconnections that B.C. Hydro has with neighbouring utilities provide a back-up in times of emergency and permit transfers of power to be made at any time. The Board finds the reserve pooling credit associated with the new 500 kV interconnection with TransAlta to be reasonable provided that the credit is not taken until the line has been placed in service and appropriate agreements have been entered into with TransAlta.

There are uncertainties in B.C. Hydro's forecasts of demand and supply that may affect the surplus on the company's system after the requirements of its service area have been met. For example, if economic conditions were to improve over those forecast there would be a consequent increase in the domestic demand for electricity in the years ahead.

Another uncertainty relates to Alcan's planned additional aluminum smelters and power generation facilities at Kitimat. Although the Board is not directly involved with the planning, construction or operating methods of B.C. Hydro or Alcan for domestic purposes, the Board is required to satisfy itself that the power and energy proposed for export is surplus to reasonably foreseeable Canadian requirements. In the view of the Board, there may be several options for the supply of firm power to Alcan in the late 1980's if and when the proposed smelters are committed for construction. These are matters that must be resolved by Alcan, B.C. Hydro, and provincial authorities before the loads to be served by B.C. Hydro after 1988 can be determined.

The Board recognizes that in most years future waterflows will be higher than the flows in the critical years used in estimating the dependable surplus; this would tend to increase the future surplus of B.C. Hydro. As well, the quantity of energy available for export might be augmented by energy from other Canadian utilities or imported from the U.S.

With respect to the availability of energy from Burrard, the Board notes that a similar situation exist-

ed with respect to environmental operating permits for the Burrard Plant at the time of B.C. Hydro's last public hearing. At that time, B.C. Hydro had an expectation of applying for an operating permit but no such permission was, in fact, granted. In the present instance the Energy Removal Certificate recently issued to B.C. Hydro does not permit the operation of Burrard to generate power for export but the Board notes that the certificate may be amended, in certain circumstances, upon application to the Minister. Also, B.C. Hydro is in the process of applying for permits under the province's Waste Management Act to operate Burrard for domestic purposes. In light of the above evidence, the Board finds enough uncertainty over the availability of energy from Burrard that it is not prepared at this time to give any credit for supply, reserve, or surplus of capacity or energy that might be generated at Burrard during normal operations.

Several intervenors proposed that B.C. Hydro should not be granted export licences until such time as it had advanced its program of rural electrification. The actual arrangements for rural electrification are beyond the jurisdiction of this Board, but the Board is satisfied that the quantities of power and energy that would be required if the program were to be accelerated would be very small relative to the capability of B.C. Hydro and would have a negligible effect on the surplus available for export over the forecast period.

The Board accepts the probable forecasts of demand and supply provided by the Applicant for the early years of the requested licence period and notes the increasing probability of substantial variance from those forecast in the later years of the requested licence period. In particular, the Board is prepared to accept the estimates of demand, supply and surplus for the water-years 1984-85, 1985-86, 1986-87, and 1987-88 as filed by the Applicant and summarized in Appendices 4, 5, and 6.

On the basis of these estimates, the Board is satisfied that B.C. Hydro will have up to the requested amounts of firm power and energy surplus to reasonably foreseeable Canadian requirements up to 1988. In the year 1988-89, the forecasts of the Applicant show that the energy surplus drops significantly, even under average flow conditions. Also in 1988-89 and 1989-90, it is the view of the Board that Alcan could require firm power if its smelter expansion plan were to proceed without a corresponding expansion of its power generating facilities. Consequently, the Board is not satisfied at this time that there will be firm power and energy surplus to reasonably foreseeable Canadian requirements in the last two years of the licence period applied for.

Although the Applicant requested a six-year licence term to allow flexibility in negotiations, it appears to the Board that a term of four years would not place any unreasonable constraint on the commercial activities of B.C. Hydro.

As to the quantity of energy that might be available for export as interruptible energy, the Board is satisfied that under conditions of high waterflows and lower-than-predicted loads or imports of energy, a quantity of up to 15 000 GW.h per year, excluding any generation at Burrard, could be surplus to Canadian requirements and available for export. This is illustrated in Appendix 7.

#### **4.2 Offers to Canadian Purchasers**

The normal practice of Canadian utilities is to maintain communication with neighbouring utilities that are directly interconnected, or are economically accessible via the transmission systems of third parties, respecting the possibility of mutually beneficial power transactions. Interconnection agreements which are negotiated between Canadian utilities may have an effect upon the demand, supply, and surplus position of a utility which is seeking power export licences. The agreements may also specify rates for the various classes of power transfer.

Although the Board seeks to ensure that all affected Canadian parties are aware of export proposals and have the opportunity of purchasing such power and energy if needed, the Board is not directly involved with the nature or timing of the arrangements made between electric utilities in Canada. Thus, the responsibility for making appropriate arrangements for supply rests with the utilities requiring that supply. To establish that all interested parties have had a reasonable opportunity to make these arrangements, and in order to afford additional protection to Canadian requirements, the Board would condition any firm power licence it might issue to require the Licensee to submit evidence that the power and energy have first been offered to potential purchasing utilities in Canada and to file any responses to such offers. For interruptible exports, the Board is of the view that if any Canadian utility wishes to pre-empt such exports, the onus to initiate the interruption is on that utility. Any interruptible licence that might be issued would contain a condition preventing the Licensee from exporting whenever such energy was needed to supply other Canadian utilities in certain circumstances.

B.C. Hydro agreed to the request of Alberta Power that, in future, Alberta Power should have the same opportunity, as is now afforded directly interconnected utilities, to purchase power and energy that B.C. Hydro proposes to export. Alberta Power accepted responsibility for arranging wheeling from the system of B.C. Hydro. Any licence that the Board



may issue would be conditioned to require B.C. Hydro to provide similar opportunities to all electric utilities in British Columbia and Alberta to purchase power and energy proposed for export.

#### **4.3 Export Price**

In assessing the suitability of an export price, the Board has developed three guidelines: the export price should recover the appropriate share of costs incurred in Canada; it should not be less than the price for equivalent service to Canadian customers; and it should not be materially less than the least cost alternative in the proposed market area.

##### **4.3.1 Applicable Costs in Canada**

The Board has considered only the incremental costs associated with the proposed exports, as the evidence showed that all the generating facilities required to make the proposed exports have already been constructed to supply the load in British Columbia and that, with the exception of Revelstoke, there are no plans to place any major new facilities in service before 1990.

Several intervenors took the position that exports should recover some of the capital costs of facilities such as Revelstoke, and some of the indirect costs to the communities which had been involved in recent construction projects of B.C. Hydro. However, no evidence was adduced to link these costs to the incremental costs of making the proposed exports.

For hydroelectric generation the total incremental costs of B.C. Hydro are about 5 mills/kW.h. To allow B.C. Hydro to compete in U.S. markets without undermining the existing energy pricing structure, the Board would condition any licence it might issue to provide for a floor price, which would provide a substantial margin over cost and which would correspond to the lowest market prices experienced recently. The Board would set the floor price for power and energy at 11 mills/kW.h net in Canadian funds at the international border. The Board expects that the actual prices received most of the time would exceed the floor price by a considerable amount.

Under normal circumstances, if thermal power were flowing to British Columbia from Alberta when B.C. Hydro is exporting, the Board would, for the purpose of determining the export price, deem that the net amount of thermal energy which is available to B.C. Hydro is being exported.

If Burrard were started up to meet Canadian requirements and were kept on line solely for operational reasons while B.C. Hydro was exporting, the export would not be deemed to be an export of thermally-generated energy. In this case, the price of the energy exported would reflect the cost of hydraulic energy. In the event of exports being made from

Burrard in an emergency situation in the U.S., the price of the power and energy being exported would reflect the cost of thermal energy and the fuel component of the export price would be at least 105 per cent of the licensee's incremental fuel cost, plus 3.0 mills/kW.h. Any license which the Board might issue would contain conditions to this effect. With these licence conditions the Board is satisfied that all applicable costs in Canada would be recovered.

##### **4.3.2 Price to Canadian Purchasers**

West Kootenay expressed concern that it might be unable to purchase required supplies if B.C. Hydro entered into firm export contracts and argued that it should have the right to purchase a portion of such blocks of power and energy.

In the view of the Board, the benefits to West Kootenay under the arrangements it has proposed would be less than the potential costs to B.C. Hydro if B.C. Hydro found itself unable to secure export contracts because of a risk that a part of the sale could be intercepted by a Canadian purchaser. B.C. Hydro has stated that it is prepared to supply the firm requirements of West Kootenay and, in the view of the Board, it is incumbent upon West Kootenay to negotiate a suitable contract with B.C. Hydro for supplies under the terms and conditions which are necessary to meet the loads of West Kootenay.

To ensure that the export prices meet the second price guideline, the Board would impose conditions in any licences it might issue to require that interruptible energy be open to interception by, and proposed exports of firm power and energy be first offered to, all interconnected electric utilities in British Columbia and Alberta on terms, including price, no less favourable than those negotiated with the foreign purchaser.

With these licence conditions, the Board is satisfied that export prices would not be less than the price to Canadian purchasers for equivalent service.

##### **4.3.3 Least Cost Alternative**

With respect to the requirement that the export price not be materially lower than the least cost alternative to the foreign purchaser, the Board notes that in recent years interruptible energy prices have weakened in the export markets accessible to B.C. Hydro, and that there is uncertainty about future price levels.

The Board accepts B.C. Hydro's contention that the current market price for interruptible energy will, in general, constitute the least cost alternative available to an export customer. Interruptible exports would therefore satisfy the Board's third guideline if made at or close to the current market rate.



With respect to the requested firm licence, the Board is satisfied that in the present circumstances it would be beneficial to Canada to allow B.C. Hydro to enter into firm sale contracts at prices which are not necessarily higher than those for interruptible energy provided the prices are above the floor price of 11 mills/kW.h. Any licence issued would contain a condition requiring that the price be no less than 11 mills/kW.h., at the international border but as indicated previously, the Board expects that prices would normally be higher than this. The Board would also require that any contract for the supply of firm power or energy be submitted for its approval before B.C. Hydro entered into a commitment to make an export sale, and would require B.C. Hydro to provide a complete justification of the proposed pricing. In the event of capacity sales only, the Board would require that there be a charge for capacity that reflects the value of the service provided.

On the basis of the foregoing, the Board is satisfied that the prices to be charged for the firm power and energy to be exported are just and reasonable in relation to the public interest.

#### **4.4 Environmental Considerations**

The Applicant requested licences that would permit the export of electricity generated from the burning of natural gas at the Burrard Station.

The Board is not prepared at this time to issue licences permitting Burrard to be used to generate power for exports under normal conditions (refer to section 4.1), so the matter of environmental impact does not arise. However, the Board is prepared to allow exports while Burrard is being used in emergencies or for operational or testing purposes, as at present.

Hydroelectric developments do have a significant impact on lands and waterways, and the Board recognizes the concerns of several intervenors in these matters. However, given that the plants have been constructed to meet domestic loads, the Board is of the view that the proposed exports would result in negligible incremental effects on lands or waterways as they now exist and would not lead to future construction or flooding. The Board is therefore satisfied that no material incremental environmental impact would result from the production of power or energy which the Applicant seeks to export.

#### **4.5 Possible Displacement of Gas by Electricity in Export Markets**

Concern was expressed in several submissions (the APMC, Westcoast, CPA) and in argument that exports of electricity would displace Canadian gas exports. However, no evidence was provided regarding the manner in which gas exports might be affected by electricity exports, the quantities of gas which

might be involved, or the economic losses which might be incurred by Canadians due to gas displacement.

It is the view of the Board that the impact of electricity exports on gas exports is difficult to assess at this time. To make this assessment, it would be necessary to demonstrate the nature and extent of the substitutability of electricity for gas in each sector of the export markets served and to relate these data to the quantities of electricity now proposed for export. No evidence was adduced by any intervenor in this regard. For these reasons, the possible displacement of gas exports by electricity exports cannot be taken into account by the Board in its disposition of these applications. Furthermore, if B.C. Hydro does not export electricity it seems likely that other sellers of electricity may be able to meet the requirement in the proposed market area.

#### **4.6 Request to Renew, with Modifications, Licence EL-128 (Firm Power and Energy)**

B.C. Hydro has not made exports of firm power under the short-term firm licence since 1973. However, the Applicant has negotiated an agreement to sell firm energy to the Department of Water and Power of the City of Los Angeles, and it is anticipated that various attractive market opportunities may arise to sell firm power, firm energy, or both.

The Board is satisfied that the issuance of a licence under the proposed terms and conditions will not result in any obligation or implied commitment to undertake or continue the export of electric power beyond the date specified in the licence.

The Board notes that substantial quantities of electricity have been exported and wheeled through the United States in recent months. The evidence does show that there is keen bargaining on all matters pertaining to access to transmission facilities in the United States and the fees and charges associated therewith. The Board is of the view that access to United States markets can be arranged by B.C. Hydro in negotiation with the other parties.

The Board is satisfied that a surplus hydroelectric capability of 2 000 MW and 6 000 GW.h per year from hydroelectric generation could be available in the period 1984-88 under most flow conditions.

Having satisfied itself that the export of firm power would be in Canada's interest, the Board is prepared to grant a firm power licence to enable B.C. Hydro to dispose of its surplus capacity and energy on the best terms it can secure provided certain criteria are met. The licence would be conditioned to protect Canadian priorities. For the reasons given in Section 4.1, the Board would require that the licence end on 30 September 1988.

The existing short-term firm power Licence EL-128 is conditioned to limit export commitments to 65 percent of the forecast energy surplus in the coming water-year, and B.C. Hydro has requested that the 65 percent limit be applied to the combined hydraulic and thermal surplus in any new licence that may be issued. The Board accepts that B.C. Hydro gives reasonable priority to meeting Canadian demands and, in any event, is prepared to curtail export loads before curtailing Canadian firm loads.

After giving careful consideration to all the information which it considers relevant, the Board is prepared to allow B.C. Hydro to commit up to 100 percent of its estimated dependable hydraulic surplus to firm export. The Board would require B.C. Hydro to submit revised estimates of surplus annually, as at present, with any estimated demand of Alcan shown as a separate item. Thus, the Board would become informed if a requirement to supply Alcan should arise in future.

The Board would limit the quantity of power and energy that may be exported to the lesser of 2 000 MW and 6 000 GW.h per year or the dependable surpluses estimated annually by B.C. Hydro and approved by the Board.

Condition 10(a) of Licence EL-128 requires that the price for firm power and energy exports shall be greater than the price for interruptible energy in the same period. The Board accepts that conditioning the price of firm energy relative to interruptible energy would impose unnecessary constraints on the ability of B.C. Hydro to compete in a highly competitive market in which prices fluctuate widely. The Board is of the opinion that B.C. Hydro has sufficient incentive to negotiate and to obtain the best prices in the market area to maximize its revenues. Prices would be above the floor price of 11 mills/kW.h net at the international border, which is, in the Board's view, the reasonable minimum price. Considering that the licence would be issued for four years only and that blocks of firm power and energy would be offered first to Canadian utilities under the same terms and conditions, including price, as the export, the Board believes that Canadian interests are sufficiently protected.

The price to be charged for firm power exports would normally be established by negotiation. The appropriate price would depend upon the duration, load factor, and other terms of any contract that might be negotiated. Therefore, the Board would condition the firm licence to require that export contracts which may be negotiated be submitted for the approval of the Board prior to commitment. A justification of the proposed export price would be required. In this way, the Board could ensure that the price in the contract meets the criteria used by the Board in

satisfying itself that the export price is just and reasonable.

Any approval that the Board might issue in respect of a sales agreement would end upon expiry of the licence in September 1988. The Board would not impose by licence condition any other limit on the term of firm sales contracts.

The Board is prepared to authorize B.C. Hydro to export firm power and energy in amounts up to 2 000 MW and 6 000 GW.h per year in the period 1 October 1984 to 30 September 1988. For the reasons given in the following section, the Board proposes to issue a new licence and to revoke Licence EL-128, subject to approval of the new licence by the Governor in Council. The quantity authorized for export in the period ending on 30 September 1984 is the same as that authorized by EL-128. The terms and conditions of the proposed new licence are set out in Appendix 8. The licence shall commence on the date of approval by the Governor in Council of the revocation of Licence EL-128 and end on 30 September 1988.

#### **4.7 Request for Approval of Los Angeles Agreement**

The Los Angeles Agreement would expire on 30 November 1986, some 22 months before the expiry of the firm power and energy licence that the Board is prepared to issue to B.C. Hydro.

The Agreement calls for no sale of power. The quantity of energy proposed for export is less than 100 percent of the dependable hydroelectric surplus shown in Appendix 5, and no utility in British Columbia or Alberta was interested in obtaining the energy on the terms and conditions proposed in the contract. The Board has concluded that the energy proposed for export under the contract is surplus to Canadian requirements.

The Board is satisfied that the price of the energy which would be exported conforms with the Board's three price guidelines and is the best price which could be negotiated. Also, the price is greater than the 11 mills floor price that the Board is satisfied is a reasonable minimum price. Since the price is lower than some of the prices for interruptible energy in the same market, the Board would have to amend condition 10 of Licence EL-128 to permit the export under Licence EL-128. Rather than amending the existing Licence EL-128 as requested by the Applicant, the Board believes it would be expedient to revoke the licence and issue a new licence under which the Los Angeles Agreement would be approved. While this does not specifically accord with the request of B.C. Hydro, the result is the same, and the Board anticipates that the Applicant would not object to this procedure.



The Board is prepared to approve the Los Angeles Agreement for sales under the new firm power licence. The Board's approval would become effective upon the approval of the proposed firm power licence by the Governor in Council and the revocation of Licence EL-128.

#### **4.8 Request to Renew, with Modifications, Licence EL-130 (Interruptible Energy)**

The Board is satisfied that, under certain conditions, the total annual surplus of hydroelectric energy could amount to 15 000 GW.h rather than the 10 000 GW.h upper limit set in Licence EL-130.

Condition 8(b) of existing Licence EL-130 provides Canadian utilities with the opportunity to interrupt exports and to obtain supply at the export price. The Board accepts B.C. Hydro's contention that where an export sale for a block of energy for a period of up to a month is contemplated, the possibility that a Canadian utility could interrupt such a sale for a short period of time at any moment in the period may well inhibit such sales. The Board is prepared to modify Condition 8(b) by requiring that while an electric utility in British Columbia or Alberta may interrupt a sale before or after the transmission of the block has commenced, and may take all or part of that block, once the export has been interrupted, the Canadian utility must accept the energy on the same terms and conditions including price until the end of the contract period, unless otherwise mutually agreed by B.C. Hydro and the Canadian utility. The Board is satisfied that these provisions would ensure that Canadian utilities have reasonable access to interruptible energy supplies while allowing B.C. Hydro to arrange commercial contracts on attractive terms.

For the reasons given above, the Board is satisfied that the price of interruptible energy exports is just and reasonable in the public interest.

The Board is prepared to issue a licence for the export of interruptible energy with a maximum quantity of 15 000 GW.h per year less the amount of any net firm power exports and less the amount exported under international treaty agreements. The Board will condition the interruptible licence to require the approval of the Board before entering into any agreements to sell interruptible energy for periods of longer than one month. The terms and conditions of the licence are set out in Appendix 9. This licence would commence on 1 October 1984 and expire on 30 September 1990.

#### **4.9 Request to Renew, with Modifications, Licence EL-127 (Circulating Power and Energy)**

Circulating flows of power are an inherent characteristic of any power system in which there are trans-

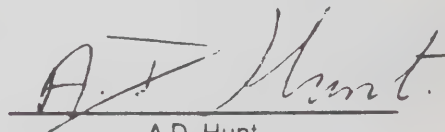
mission loops and involve no net export. Thus, the question of surplus does not arise. As there is no transfer of money, the question of price does not arise. The Board is satisfied that the proposed exports and international loop flows would not adversely affect the reliability of supply to Canadian customers.

It is necessary that such exports and imports be recorded and accounted for. In light of the evidence presented, the requested licence limit of 3 000 GW.h per year seems reasonable.


Accordingly, the Board is prepared to issue a licence to B.C. Hydro to make inter-utility carrier transfers of unscheduled circulating exchange of inadvertent power and energy for simultaneous return to Canada. The terms and conditions of the licence are set out in Appendix 10. This licence would commence on 1 October 1984 and expire on 30 September 1990.

#### **4.10 Recapitulation**

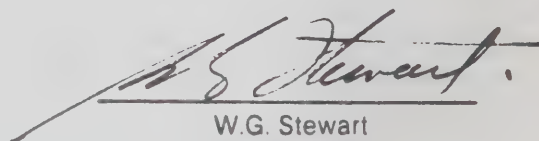
Having regard to the foregoing considerations, findings and conclusions, and having taken into account all matters that appear to it to be relevant, the Board is prepared to issue three licences to B.C. Hydro for the export of power and energy upon the terms and conditions set out in Appendices 8, 9 and 10, respectively. Subject to the approval of the Governor in Council of the new firm power licence, the Board will issue an order revoking the existing Licence EL-128 and will approve the Los Angeles Agreement under the new firm power licence.



A.D. Hunt  
Presiding Member



A.B. Gilmour  
Member

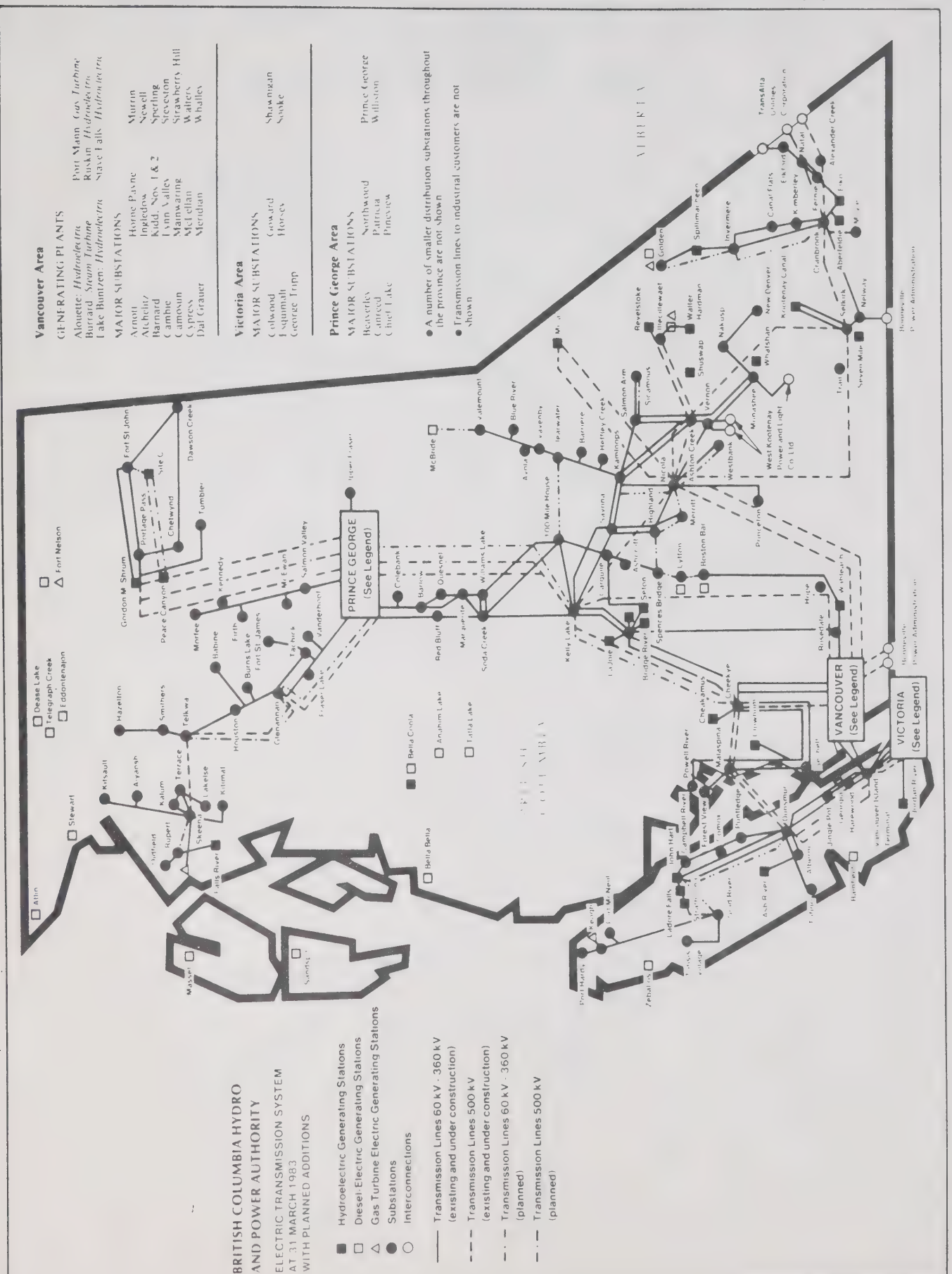


W.G. Stewart  
Member





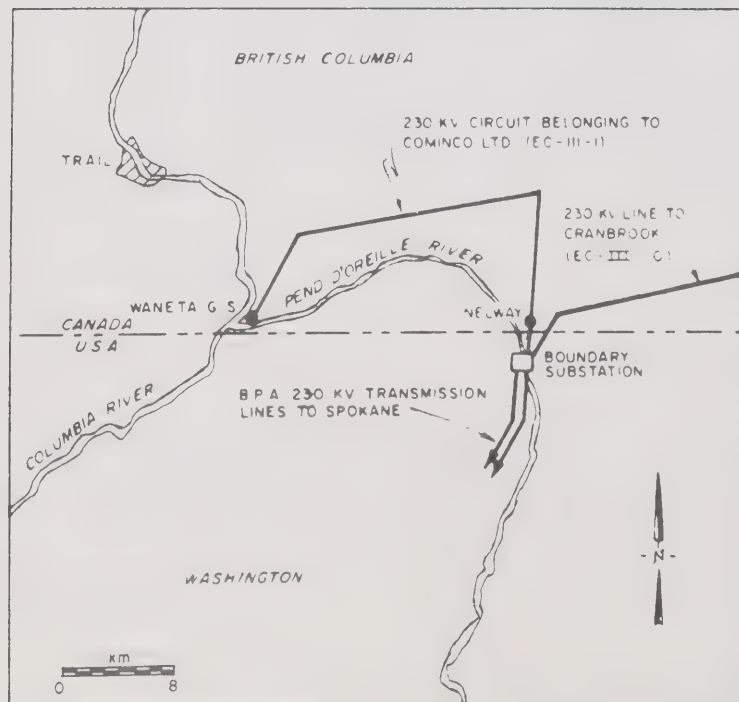
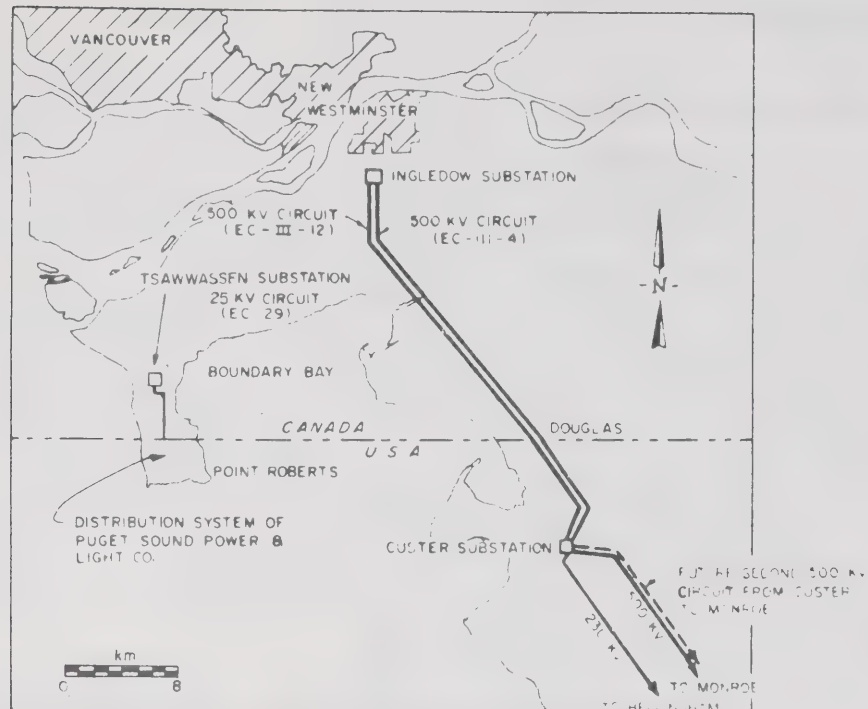








# BRITISH COLUMBIA HYDRO AND POWER AUTHORITY MAPS SHOWING INTERNATIONAL POWER LINES







## Appendix 3

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### **International Agreements**

This appendix outlines the various agreements relevant to the applications which were filed by the Applicant.

#### **1. International Exchange Agreement with Bonneville Power Administration**

The Exchange Agreement dated 25 March 1970 and the amendatory agreement dated 26 October 1978 between Bonneville and B.C. Hydro define the points of interconnection and provide for the exchange of power between the parties.

The agreement terminates at the earlier of the date of termination of B.C. Hydro's export licences or 30 June 1988.

#### **2. International Transmission Agreement with Bonneville Power Administration**

The Transmission Agreement dated 26 October 1978 between Bonneville and B.C. Hydro provides for transmission service between the Blaine, Washington and Nelway, British Columbia points of interconnection to the intertie points with the high voltage lines to California, for transmission service between Waneta, Washington and Nelway, British Columbia and for exchange accounting, measurement, scheduling arrangements and other matters.

The agreement terminates 30 March 2020 or earlier upon twelve months' notice by either party.

#### **3 International Agreement with Bonneville Power Administration for the Storage of Energy**

The letter of agreement dated 29 April, 1982 between Bonneville and B.C. Hydro provides for the reciprocal transfer or sale of storage energy and load factoring energy.

The agreement may be terminated upon one month's notice by either party

#### **4. International Agreement with Bonneville Power Administration for the Storage of Water - Revelstoke**

The letter of agreement dated 9 June 1983 between Bonneville and B.C. Hydro provides for the storage of water in non-Treaty space in the Arrow Lakes Reservoir and behind the Mica Dam to facilitate initial filling of the Revelstoke Dam reservoir.

The agreement ends on 31 August 1984.

#### **5. International Agreement with Bonneville Power Administration for the Storage of Water - Revelstoke**

The letter of agreement between Bonneville and B.C. Hydro executed on 21 September 1983, makes additional provisions for the storage of water to facilitate initial filling of the Revelstoke Dam reservoir.

The agreement ends on April 14, 1984.

#### **6. International Agreement with the Department of Water and Power of the City of Los Angeles**

The energy sales agreement dated 26 January 1984, provides for the sale of firm energy to Los Angeles, Burbank, Glendale and Pasadena.

The agreement terminates on 31 October, 1986.



## Appendix 4

### B.C. HYDRO'S ESTIMATE OF CAPACITY, DEMAND AND SURPLUS AT TIME OF ANNUAL PEAK LOAD ON EXPORT GRID (megawatts)

	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
<b>CAPACITY-HYDRO</b>						
G.M. Shrum	2 680	2 680	2 680	2 680	2 680	2 680
Peace Canyon	700	700	700	700	700	700
Mica	1 600	1 600	1 600	1 600	1 600	1 600
Revelstoke	1 800	1 800	1 800	1 800	1 800	1 800
Seven Mile	529	529	529	529	529	529
Kootenay Canal	529	529	529	529	529	529
Bridge River	500	500	500	500	500	500
Cheakamus	144	144	144	144	144	144
John Hart	126	126	126	126	126	126
Small Hydro	829	829	829	829	829	829
<b>Total Hydro</b>	<b>9 437</b>	<b>9 437</b>	<b>9 437</b>	<b>9 437</b>	<b>9 437</b>	<b>9 437</b>
<b>CAPACITY-THERMAL</b>						
Burrard	0	0	0	0	0	0
Small Thermal	332	332	322	322	322	322
<b>Total Thermal</b>	<b>332</b>	<b>332</b>	<b>332</b>	<b>332</b>	<b>332</b>	<b>332</b>
<b>TOTAL CAPACITY</b>	<b>9 769</b>	<b>9 769</b>	<b>9 769</b>	<b>9 769</b>	<b>9 769</b>	<b>9 769</b>
<b>LESS FIRM DEMAND</b>	<b>6 360</b>	<b>6 860</b>	<b>7 070</b>	<b>7 220</b>	<b>7 460</b>	<b>7 660</b>
<b>Reserves and Surplus</b>	<b>3 409</b>	<b>2 909</b>	<b>2 699</b>	<b>2 549</b>	<b>2 309</b>	<b>2 109</b>
Less Reserve	1 270	1 150	1 125	1 125	1 125	1 125
Reserve Pooling						
Credit	0	400	400	400	400	400
<b>SURPLUS</b>	<b>2 139</b>	<b>2 159</b>	<b>1 974</b>	<b>1 874</b>	<b>1 584</b>	<b>1 384</b>

- NOTES:
1. Figures based on 1 October to 30 September Water-Year
  2. FIRM DEMAND is the estimated total for B.C. Hydro integrated system and includes the West Kootenay deficiency, proposed exports to Point Roberts and proposed exports under the Skagit River Treaty
  3. According to B.C. Hydro the Reserve is the reserve necessary to maintain an annual loss-of-load probability of not greater than one day in ten years
  4. The "Reserve Pooling Credit" reflects the reduction in capacity reserve required due to the new 500 kV transmission interconnection between B.C. and Alberta





## Appendix 5

### B.C. HYDRO'S ESTIMATE OF ANNUAL ENERGY CAPABILITY, LOADS AND SURPLUS DEPENDABLE STREAMFLOW CONDITIONS (gigawatthours)

	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
<b>CAPABILITY-HYDRO</b>						
G.M. Shrum	11 609	15 029	12 158	11 024	8 992	8 699
Peace Canyon	2 941	3 823	3 221	3 072	2 440	2 309
Mica	6 592	6 306	6 652	6 881	7 732	8 683
Revelstoke	6 785	6 791	7 256	7 721	8 054	8 607
Seven Mile	3 168	2 359	2 562	2 710	3 455	3 555
Kootenay Canal	3 242	1 802	1 660	2 651	3 313	4 060
Bridge River	2 409	2 519	2 518	2 782	2 353	3 466
Cheakamus	739	691	887	787	798	854
John Hart	874	743	961	890	944	961
Small Hydro	2 980	2 675	3 249	3 427	3 331	3 505
<b>TOTAL HYDRAULIC CAPABILITY</b>	<b>41 339</b>	<b>42 738</b>	<b>41 124</b>	<b>41 945</b>	<b>41 342</b>	<b>44 699</b>
LESS FIRM LOADS	36 238	37 938	39 024	40 085	41 342	42 525
<b>HYDRAULIC SURPLUS</b>	<b>5 101</b>	<b>4 800</b>	<b>2 100</b>	<b>1 860</b>	<b>0</b>	<b>2 174</b>
<b>THERMAL CAPABILITY</b>						
Burrard	3 430	3 430	3 430	3 430	3 430	3 430
Small Thermal	0	0	0	0	0	0
<b>Total Thermal</b>	<b>3 430</b>	<b>3 430</b>	<b>3 430</b>	<b>3 430</b>	<b>3 430</b>	<b>3 430</b>
Energy Purchase	0	0	0	0	0	0

- NOTES:
1. Figures based on 1 October to 30 September Water-Year
  2. FIRM LOADS is the estimated total for B.C. Hydro integrated system and includes the West Kootenay deficiency, proposed exports to Point Roberts and proposed exports under the Skagit River Treaty
  3. Critical period from October 1942 to September 1948





## Appendix 6

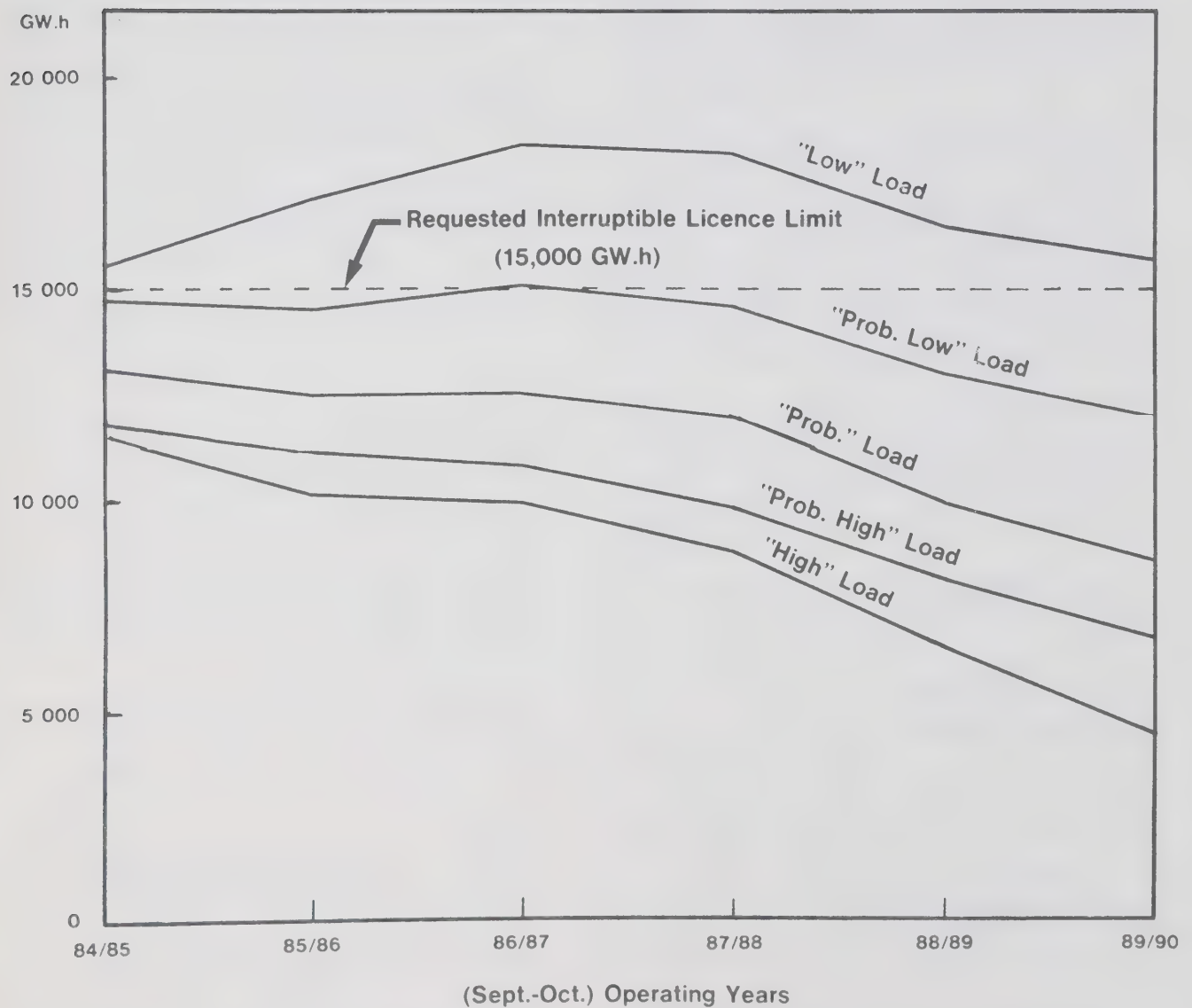
### B.C. HYDRO'S ESTIMATE OF ANNUAL ENERGY CAPABILITY, LOADS AND SURPLUS AVERAGE STREAMFLOW CONDITIONS (gigawatthours)

	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
<b>CAPABILITY-HYDRO</b>						
G.M. Shrum	13 688	13 685	13 131	13 557	13 022	13 430
Peace Canyon	3 454	3 470	3 339	3 442	3 325	3 433
Mica	7 377	7 525	7 560	7 522	7 510	7 513
Revelstoke	7 546	7 854	7 889	7 867	7 809	7 812
Seven Mile	3 140	3 140	3 140	3 140	3 140	3 140
Kootenay Canal	3 120	3 120	3 120	3 120	3 120	3 120
Bridge River	3 270	3 270	3 270	3 270	3 270	3 270
Cheakamus	840	840	840	840	840	840
John Hart	930	930	930	930	930	930
Small Hydro	2 885	2 885	2 885	2 885	2 885	2 885
<b>TOTAL HYDRAULIC CAPABILITY</b>	<b>46 250</b>	<b>46 719</b>	<b>46 104</b>	<b>46 573</b>	<b>45 851</b>	<b>46 373</b>
LESS FIRM LOADS	36 238	37 938	39 024	40 085	41 342	42 525
<b>HYDRAULIC SURPLUS</b>	<b>10 012</b>	<b>8 781</b>	<b>7 080</b>	<b>6 486</b>	<b>4 509</b>	<b>3 848</b>
<b>THERMAL CAPABILITY</b>						
Burrard	3 430	3 430	3 430	3 430	3 430	3 430
Small Thermal	0	0	0	0	0	0
<b>Total Thermal</b>	<b>3 430</b>	<b>3 430</b>	<b>3 430</b>	<b>3 430</b>	<b>3 430</b>	<b>3 430</b>
Energy Purchase	0	0	0	0	0	0

- NOTES:
- 1 Figures based on 1 October to 30 September Water-Year.
  - 2 FIRM LOADS is the estimated total for B.C. Hydro integrated system and includes the West Kootenay deficiency, proposed exports to Point Roberts and proposed exports under the Skagit River Treaty.



HYDRO ENERGY SURPLUS  
TO THE B.C. HYDRO SYSTEM UNDER  
THE HIGHEST STREAM FLOWS ON RECORD  
FOR VARIOUS LOAD GROWTH SCENARIOS







### Conditions of Proposed Licence EL-162

#### TERMS AND CONDITIONS OF EXPORT LICENCE FIRM POWER AND/OR ENERGY

1. The term of this licence shall commence on the date of revocation of Licence EL-128, and shall end on 30 September 1988.
2. The classes of inter-utility export authorized hereunder are the sale and exchange transfer of blocks of firm power and/or energy.
3. The power and energy to be exported hereunder shall be transmitted over any international power line for which a Board Certificate of Public Convenience and Necessity is in effect.
4. The quantity of power that may be exported hereunder shall not exceed the lesser of,
  - a) 2 000 MW, or
  - b) the amount of capacity determined in accordance with condition 6, that is surplus to the maximum foreseeable requirements of the Licensee's system after allowing for maintenance and reserve.
5. The quantity of energy that may be exported in any consecutive twelve-month period within the term of this licence shall not exceed the lesser of:
  - a)
    - i) in the period ending 30 September 1984, 3 000 GW.h, and
    - ii) thereafter, 6 000 GW.h, or
  - b) the sum of
    - i) the energy surplus determined in accordance with Condition 6, and
    - ii) any energy imported available for import under a firm commitment or as a return of energy exported hereunder.
6. To establish the capacity surplus referred to in paragraph (b) of Condition 4 and/or the energy surplus referred to in paragraph (b) of Condition 5, the Licensee shall file with the Board, before the first export transfer is made hereunder and thereafter on or before the 31st day of July of each year, an estimate of the supply, demand and surplus capacity and energy under dependable streamflow conditions for each month of a proposed contract, which estimate, if approved by the Board, shall supersede all previous estimates of the surpluses.
7. The Licensee shall not export energy generated at the Burrard plant hereunder or hydroelectric energy which would be replaced by energy generated at the Burrard plant except that exports may continue during the operation of the Burrard plant where the plant has been placed in service to meet an emergency either in Canada or the United States, and has been kept in service purely for testing or for operational reasons.
8. The price to be charged by the Licensee at the international border for hydroelectric energy, thermally-generated energy and any portion of the energy that would be replaced by thermally-generated energy shall be not less than the greater of:
  - (a) 105 percent of the incremental cost of production or purchase or replacement plus 3.0 mills per kW.h, or
  - (b) 11 mills per kW.h (Canadian funds)If power only is exported hereunder, there shall be a charge for the power.

The prices to be charged for power and energy shall be stated in the proposed export agreement.

The price to be charged by the Licensee for energy generated from natural gas shall be calculated by using the average export price of natural gas from British Columbia in the same month.
9. The Licensee, before committing any block of power and/or energy for export hereunder,

- a) shall first offer such power or energy to electric utilities in British Columbia and Alberta on the same terms and conditions, including price, as those on which the export would be made, and
  - b) shall obtain Board approval of the proposed export agreement.
10. The Licensee shall not, without the prior approval of the Board, amend, enter into any agreement in substitution for or in addition to, or terminate;
- the Exchange Agreement dated 25 March 1970, as amended, between the Licensee and the Bonneville Administrator, as amended;
  - the Transmission Agreement dated 12 April 1979 between the Licensee and the Bonneville Power Administration;
  - the Letter Agreement dated April 29 1982 between the Licensee and the Bonneville Power Administration; and
  - the Energy Sales Agreement dated 26 January 1984 between the Licensee and the Department of Water and Power of the City of Los Angeles.
11. The Licensee shall, within 15 days after the end of each month comprised in the term of this licence, file with the Board a report in such form and detail as the Board may specify, setting forth, for that month, information pertaining to transactions under this licence.

## Appendix 9

### Conditions of Proposed Licence EL-163

#### TERMS AND CONDITIONS OF EXPORT LICENCE INTERRUPTIBLE ENERGY

1. The term of this licence shall commence on 1 October 1984 and shall end on 30 September 1990.
2. The classes of inter-utility export transfer authorized hereunder are sale, exchange, storage, carrier and adjustment transfers of interruptible energy.
3. The energy to be exported hereunder shall be transmitted over any international power line for which a Board Certificate of Public Convenience and Necessity is in effect.
4. The quantity of energy that may be exported hereunder in any consecutive twelve-month period within the term of this licence when combined with the amounts of firm power and energy exported during the same period under the proposed Licence EL-162 shall not exceed 15 000 GW.h.
5. The Licensee shall not export energy generated at the Burrard plant hereunder or hydroelectric energy which would be replaced by energy generated at the Burrard plant except that exports may continue during the operation of the Burrard plant where that plant has been placed in service to meet an emergency either in Canada or the United States and has been kept in service purely for testing or for operational reasons.
6. The Licensee shall not export power and/or energy hereunder whenever and to whatever extent such power and/or energy is required to supply
  - a) the Licensee's firm load requirements
  - b) any firm load on the systems of British Columbia or Alberta utilities, and
  - c) any electric utility in British Columbia or Alberta willing to buy part or all of the energy under the same terms and conditions, including price, as that of the export, adjusted for differences in the cost of delivery, until the end of the contract period, unless otherwise mutually agreed by the Licensee and the Canadian utility.
7. The price to be charged by the Licensee at the international border for energy exported hereunder shall not be less than
  - a) in the case of thermally-generated emergency energy (herein defined as energy supplied for a period not exceeding 24 hours to a party during an emergency on its system which impairs or jeopardizes the ability of that party to supply its firm system demand) 105 percent of the Licensee's incremental fuel cost, plus 3.0 mills per kW.h.
  - b) in the case of hydro-electric energy, thermally-generated energy and any portion of the energy that would be replaced by thermally-generated energy, the greater of
    - i) 105 percent of the incremental cost of production or purchase or replacement plus 3.0 mills per kW.h. or
    - ii) 11.0 mills/kW.h (Canadian funds).

The price to be charged by the Licensee for energy generated from natural gas shall be calculated by using the average export price of natural gas from British Columbia in the same month.
8. The Licensee shall not, without the prior approval of the Board, amend, enter into any agreement in substitution for or in addition to, or terminate
  - the Exchange Agreement dated 25 March 1970, as amended, between the Licensee and the Bonneville Administrator;



- the Transmission Agreement dated 12 April 1979 between the Licensee and the Bonneville Power Administration;
  - the Letter Agreement dated 29 April 1982 between the Licensee and the Bonneville Power Administration; and
  - the Energy Sales Agreement dated 26 January 1984 between the Licensee and the Department of Water and Power of the City of Los Angeles.
9. The Licensee shall not, without the prior approval of the Board, enter into any agreement to sell interruptible energy for a period of longer than 1 month.
  10. The Licensee shall, within 15 days after the end of each month comprised in the term of this licence, file with the Board a report in such form and detail as the Board may specify, setting forth, for that month, information pertaining to transactions under the licence.

### **Conditions of Proposed Licence EL-164**

#### **TERMS AND CONDITIONS OF EXPORT LICENCE CIRCULATING POWER AND ENERGY FLOW**

1. The term of this licence shall commence on 1 October 1984 and shall end on 30 September 1990.
2. The class of inter-utility export transfer authorized hereunder is the inadvertent circulating flow of power and energy to the United States and its simultaneous return to Canada.
3. The power and energy to be exported hereunder shall be transmitted over any international power line for which a Board Certificate of Public Convenience and Necessity is in effect.
4. The quantity of energy that may be exported hereunder shall not exceed 3000 GW.h in any consecutive 12-month period.
5. The Licensee shall, within 15 days after the end of each month comprised in the term of this licence, file with the Board a report in such form and detail as the Board may specify, setting forth, for that month, information pertaining to transactions under this licence.







